OIPE
JUN 30 2004
PATENT & TRADEMARK OFFICE

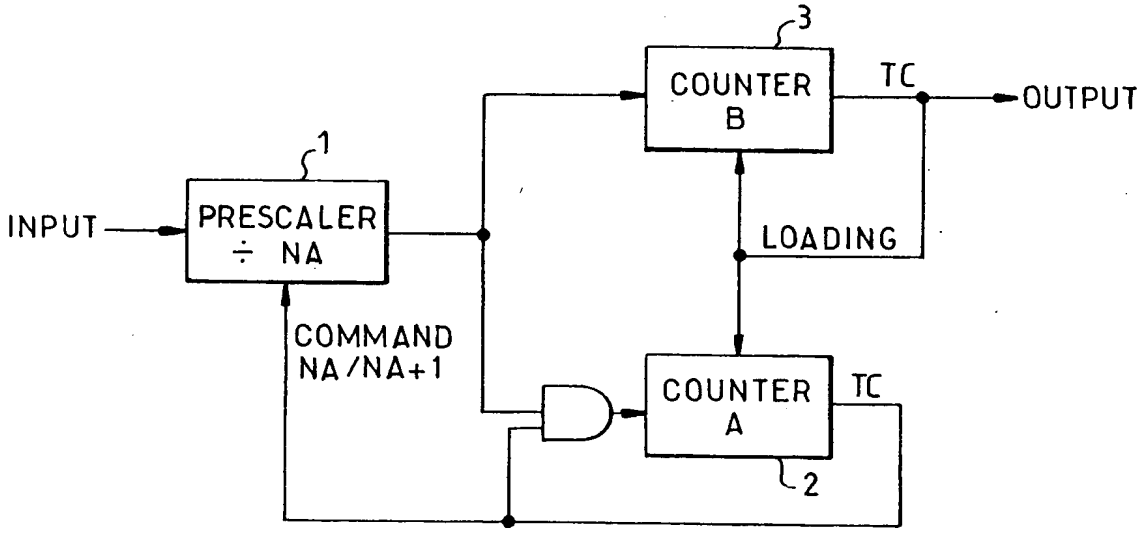

FIG.1

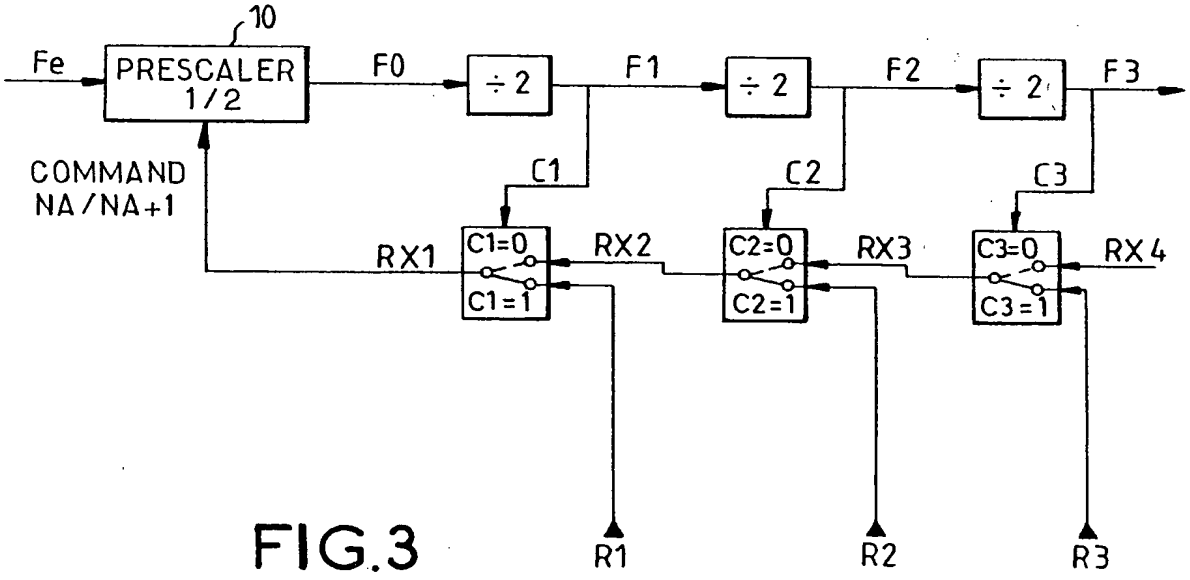

FIG.3

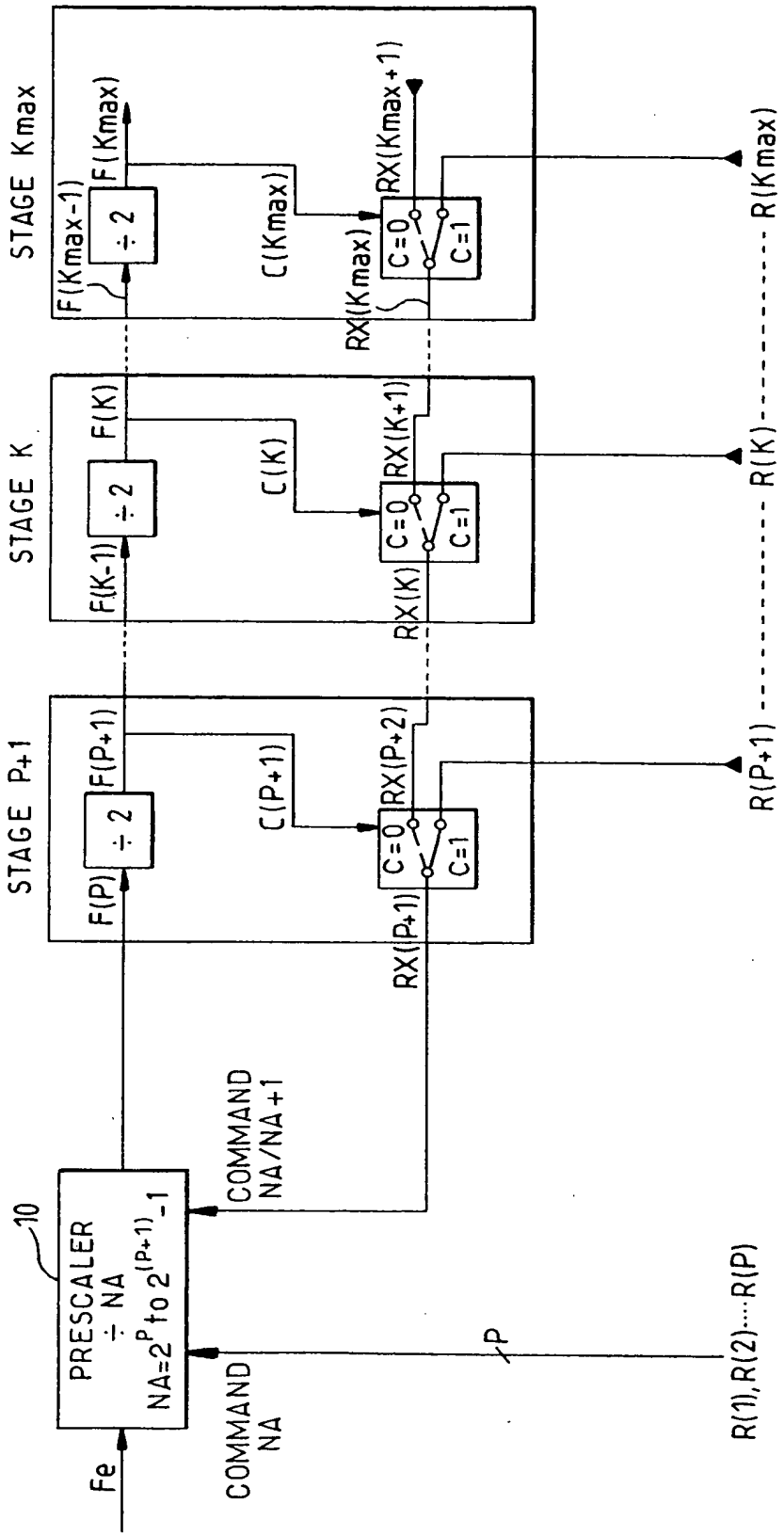
STAGE Kmax
STAGE K
STAGE P+1
F(Kmax)
F(Kmax-1)
÷ 2
C(Kmax)
RX(Kmax+1)
RX(Kmax)
C=0
C=1
R(Kmax)
F(K)
F(K-1)
C(K)
RX(K+1)
RX(K)
R(K)
F(P+1)
F(P)
C(P+1)
RX(P+2)
RX(P+1)
R(P+1)
10
PRESCALER
÷ NA
NA=2^P to 2^(P+1)-1
COMMAND
NA/NA+1
COMMAND
NA
Fe
P
R(1),R(2)...R(P)

FIG.2

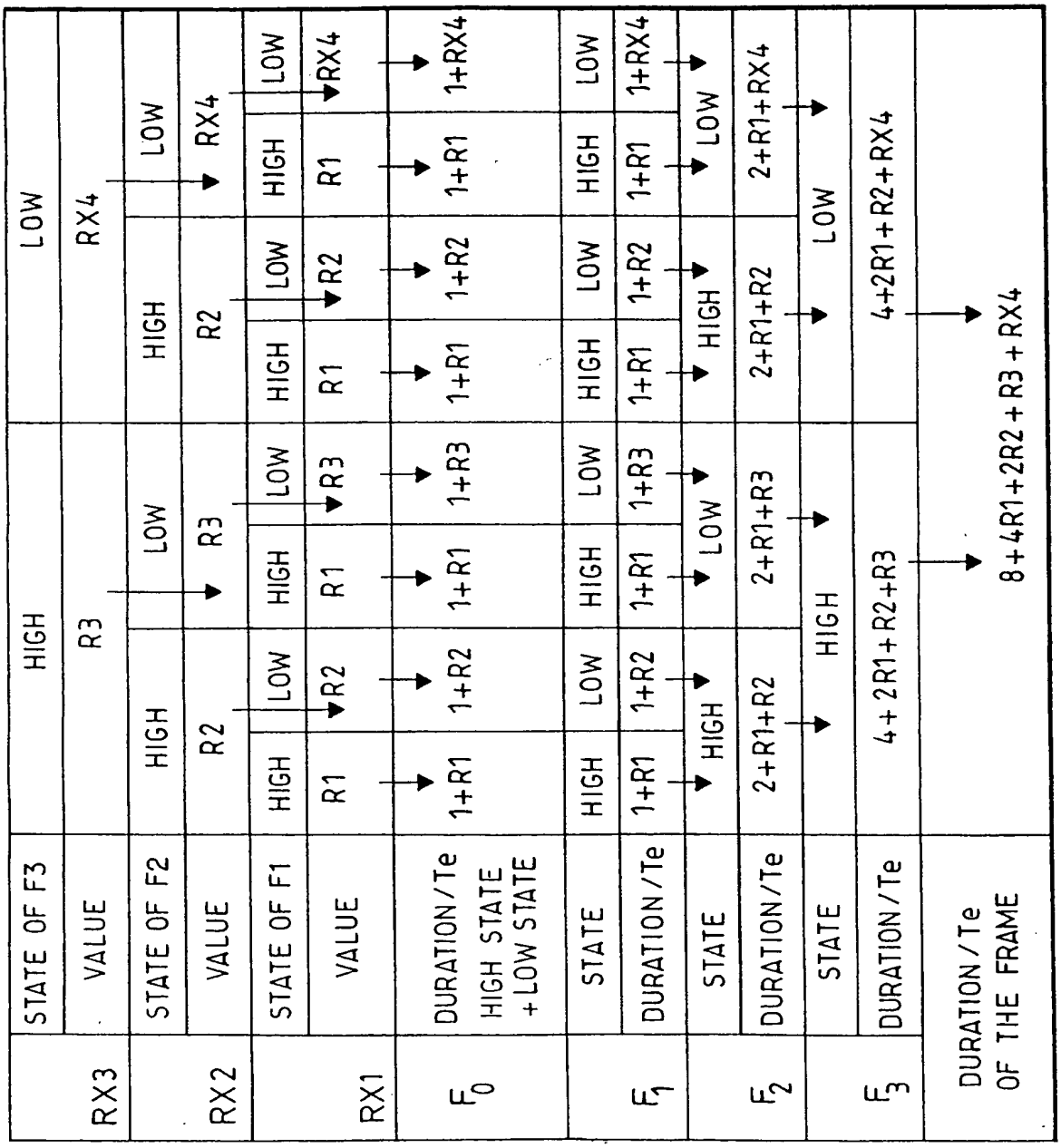
RX3
STATE OF F3
HIGH
LOW
VALUE
R3
RX4
RX2
STATE OF F2
HIGH
LOW
HIGH
LOW
VALUE
R2
R3
RX4
RX1
STATE OF F1
HIGH
LOW
HIGH
LOW
HIGH
LOW
VALUE
R1
R2
R3
R1
R2
RX4
F0
DURATION/Te
HIGH STATE
+LOW STATE
1+R1
1+R2
1+R1
1+R3
1+R1
1+R2
1+RX4
F1
STATE
HIGH
LOW
HIGH
LOW
HIGH
LOW
HIGH
LOW
DURATION/Te
1+R1
1+R2
1+R1
1+R3
1+R1
1+R2
1+R1
1+RX4
F2
STATE
HIGH
LOW
HIGH
LOW
HIGH
LOW
LOW
DURATION/Te
2+R1+R2
2+R1+R3
2+R1+R2
2+R1+RX4
F3
STATE
HIGH
LOW
LOW
DURATION/Te
4+2R1+R2+R3
4+2R1+R2+RX4
DURATION/Te
OF THE FRAME
8+4R1+2R2+R3+RX4

FIG.4

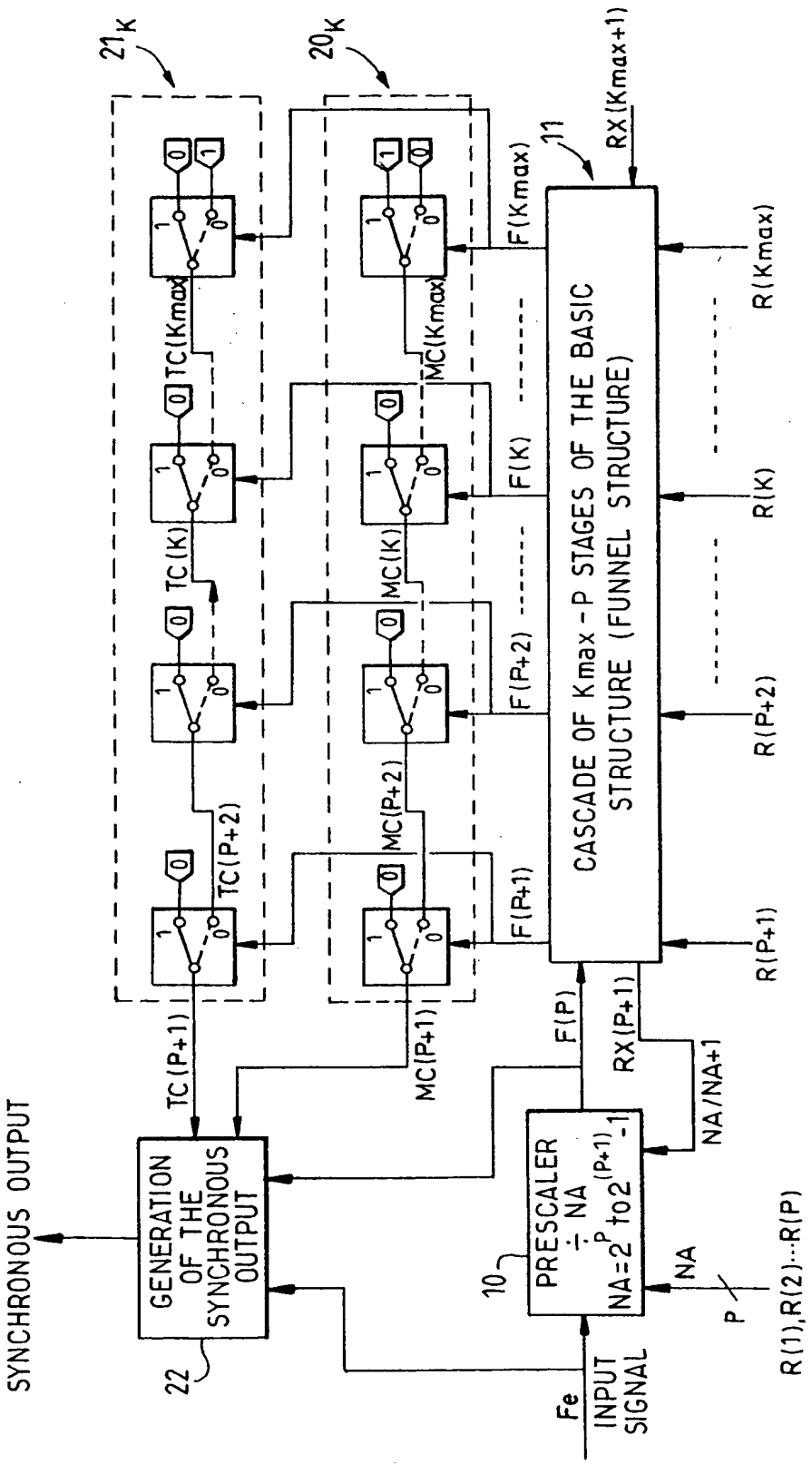
21K
20K
11
RX(Kmax+1)
F(Kmax)
R(Kmax)
TC(Kmax)
MC(Kmax)
F(K)
R(K)
TC(K)
MC(K)
F(P+2)
R(P+2)
TC(P+2)
MC(P+2)
F(P+1)
R(P+1)
CASCADE OF Kmax-P STAGES OF THE BASIC STRUCTURE (FUNNEL STRUCTURE)
TC(P+1)
MC(P+1)
F(P)
RX(P+1)
NA/NA+1
SYNCHRONOUS OUTPUT
GENERATION OF THE SYNCHRONOUS OUTPUT
22
PRESCALER ÷ NA NA=2^P to 2^(P+1)-1
10
NA
P
R(1),R(2)···R(P)
Fe
INPUT SIGNAL

FIG.5A

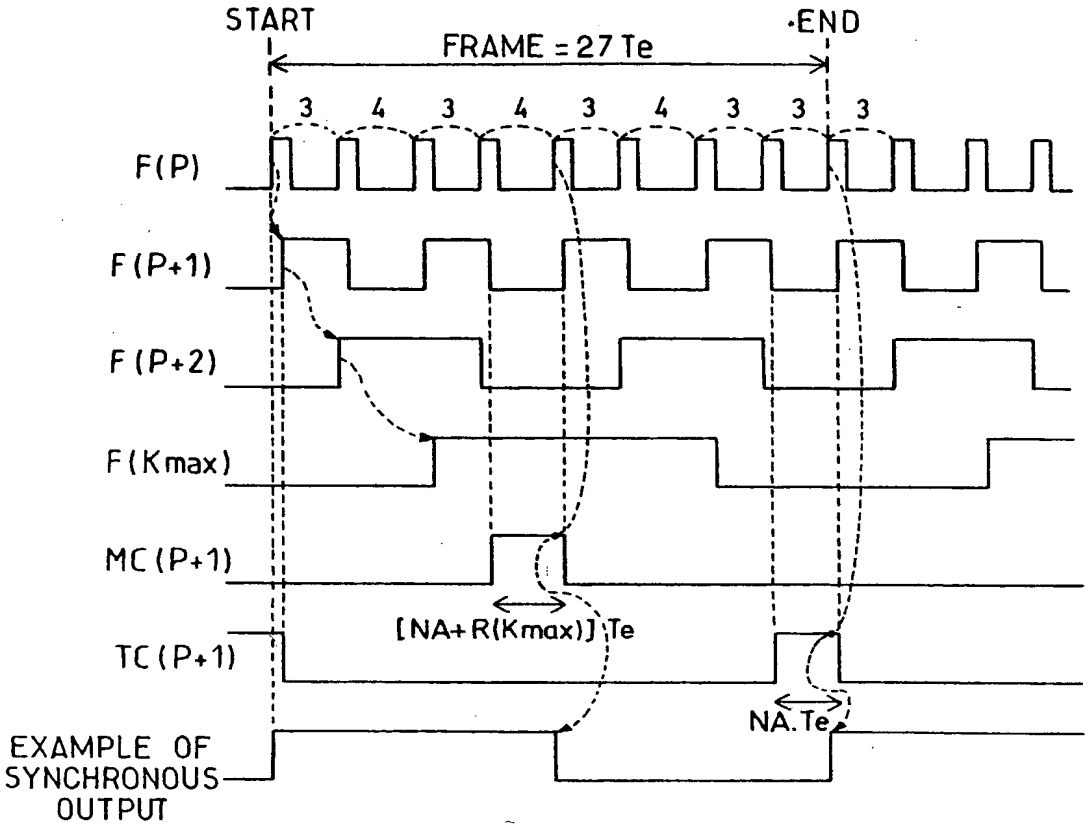
START
END
FRAME = 27 Te
3 4 3 4 3 4 3 3 3
F(P)
F(P+1)
F(P+2)
F(Kmax)
MC(P+1)
[NA+R(Kmax)] Te
TC(P+1)
NA.Te
EXAMPLE OF SYNCHRONOUS OUTPUT

FIG. 5B

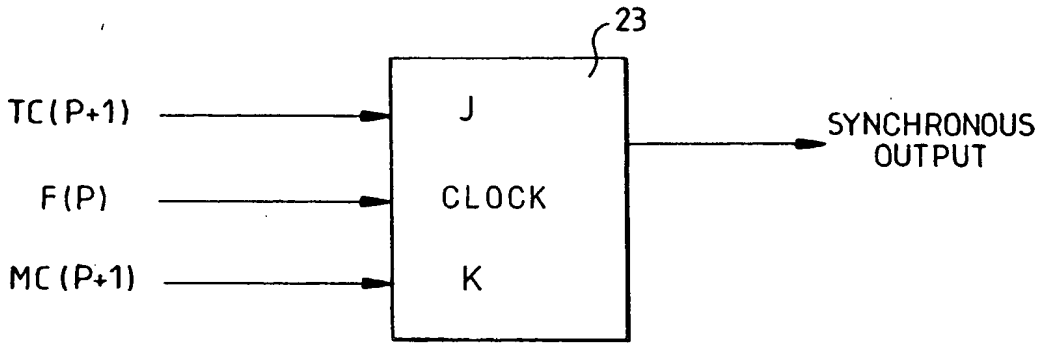
23
TC(P+1)
F(P)
MC(P+1)
J
CLOCK
K
SYNCHRONOUS
OUTPUT

FIG.6

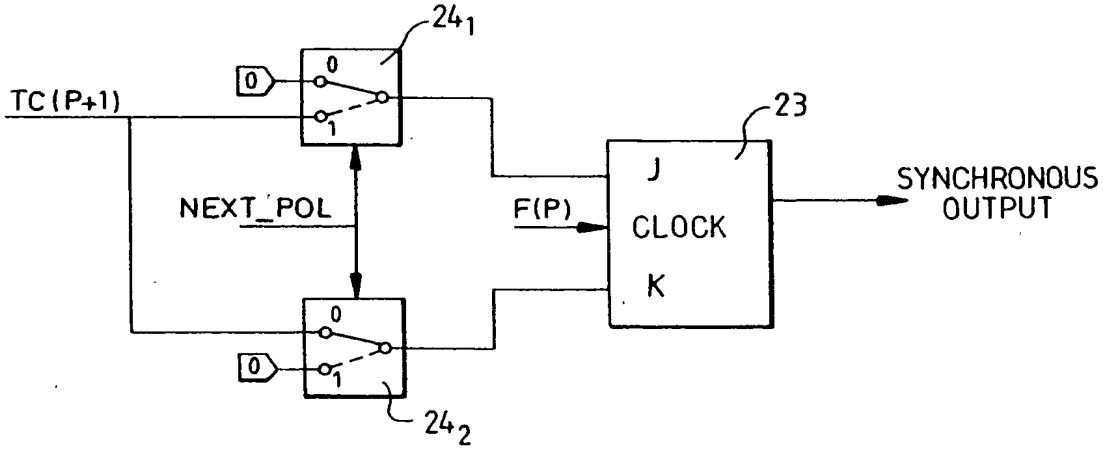
24₁
0
0
1
TC(P+1)
NEXT_POL
23
J
F(P)
CLOCK
K
SYNCHRONOUS
OUTPUT
0
0
1
24₂

FIG.7

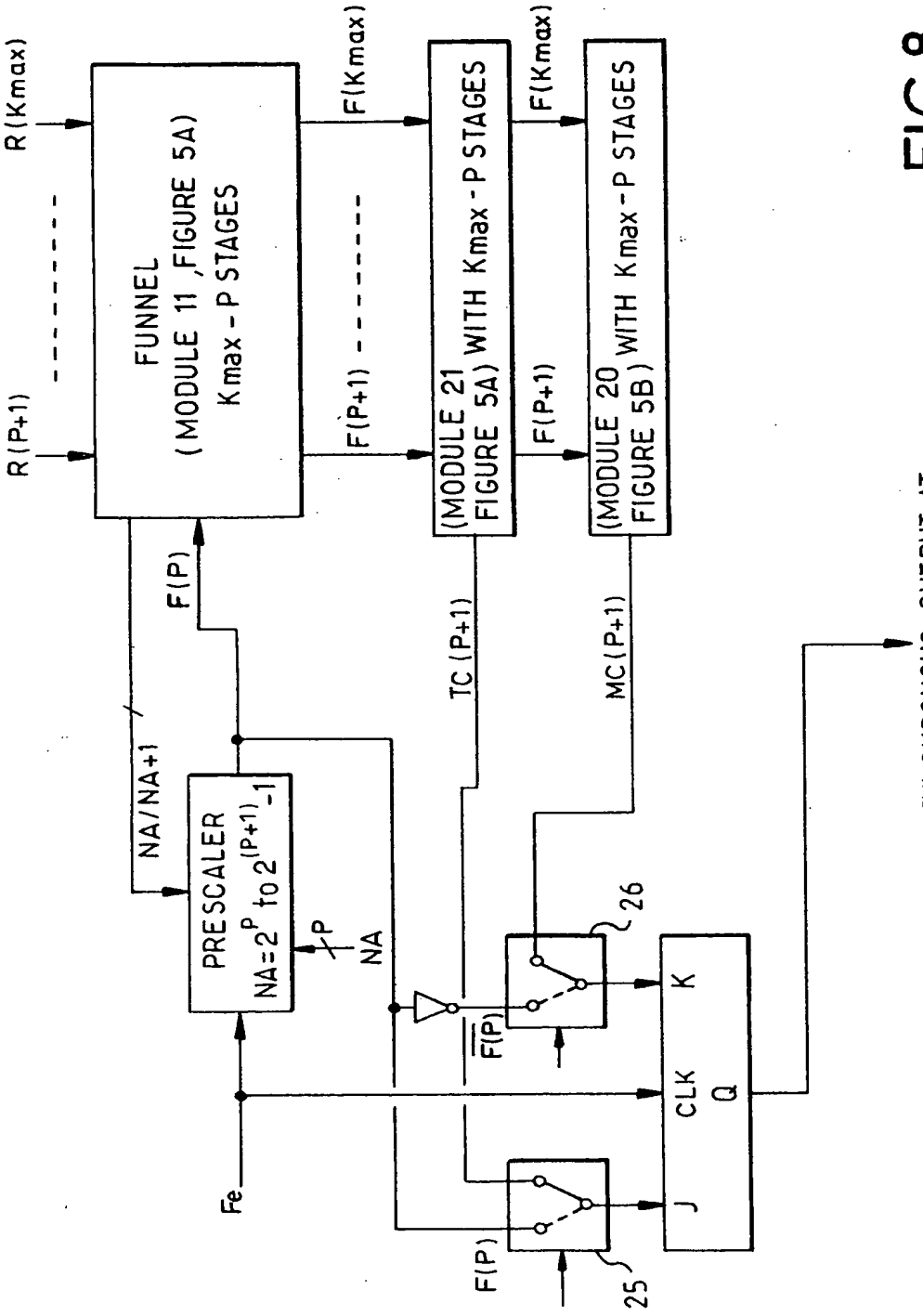
R(Kmax)
R(P+1)
FUNNEL
(MODULE 11 ,FIGURE 5A)
Kmax - P STAGES
F(Kmax)
F(P+1)
(MODULE 21
FIGURE 5A) WITH Kmax - P STAGES
F(Kmax)
F(P+1)
(MODULE 20
FIGURE 5B) WITH Kmax - P STAGES
F(P)
TC (P+1)
MC (P+1)
NA/NA+1
PRESCALER
NA=2^P to 2^(P+1)-1
P
NA
26
K
CLK
Q
J
F(P)
25
Fe
SYNCHRONOUS OUTPUT AT
THE FREQUENCY Fe/N WITH
N=2^P to 2^(Kmax+1)

FIG.8

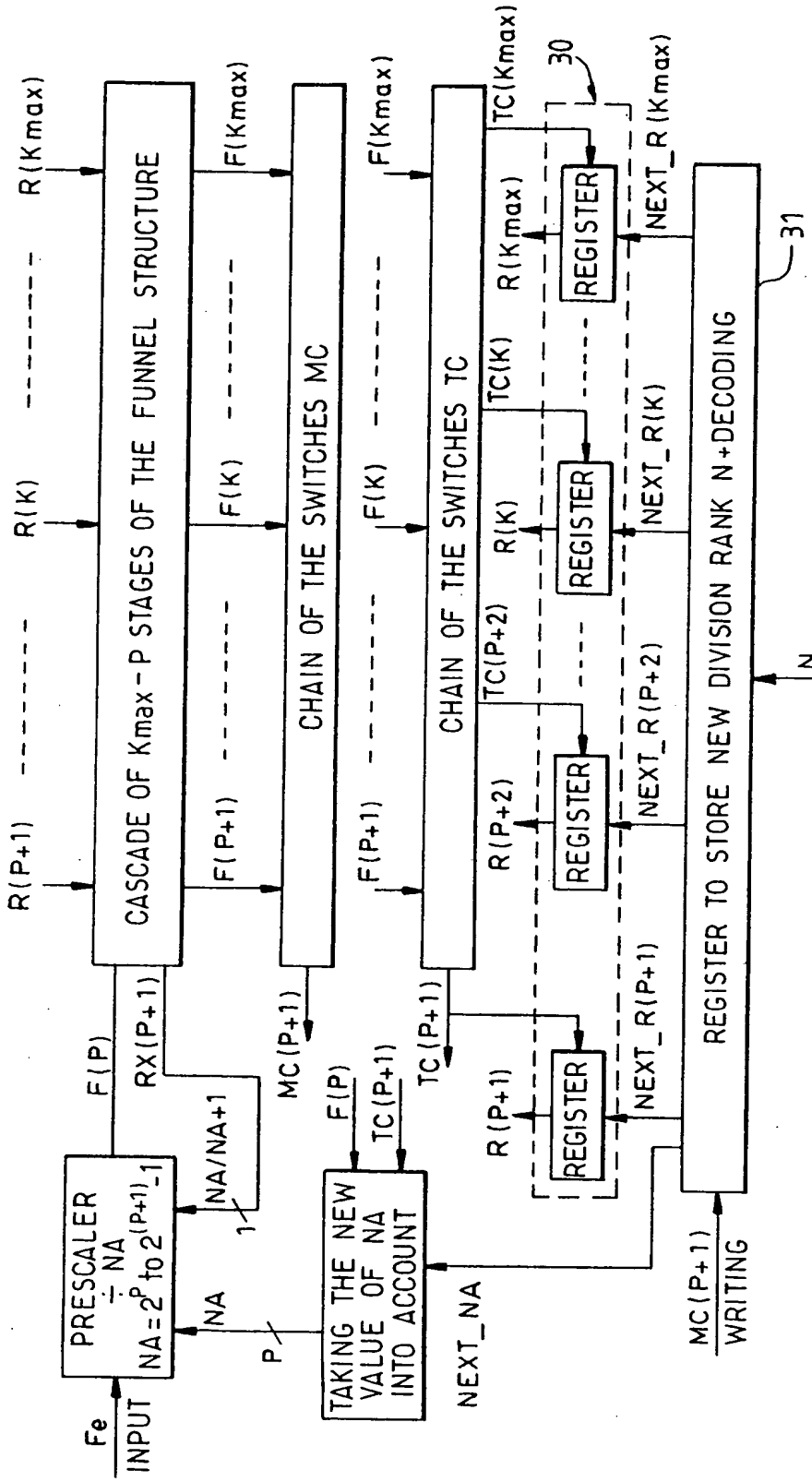
Fe
INPUT
PRESCALER ÷ NA
NA = 2^P to 2^(P+1)-1
NA
P
NA/NA+1
1
F(P)
RX(P+1)
CASCADE OF Kmax - P STAGES OF THE FUNNEL STRUCTURE
R(Kmax)
R(K)
R(P+1)
F(Kmax)
F(K)
F(P+1)
CHAIN OF THE SWITCHES MC
MC(P+1)
CHAIN OF THE SWITCHES TC
TC(Kmax)
TC(K)
TC(P+2)
TC(P+1)
TAKING THE NEW VALUE OF NA INTO ACCOUNT
NEXT_NA
REGISTER
30
NEXT_R(Kmax)
NEXT_R(K)
NEXT_R(P+2)
NEXT_R(P+1)
REGISTER TO STORE NEW DIVISION RANK N+DECODING
31
N
MC(P+1)
WRITING

FIG.9

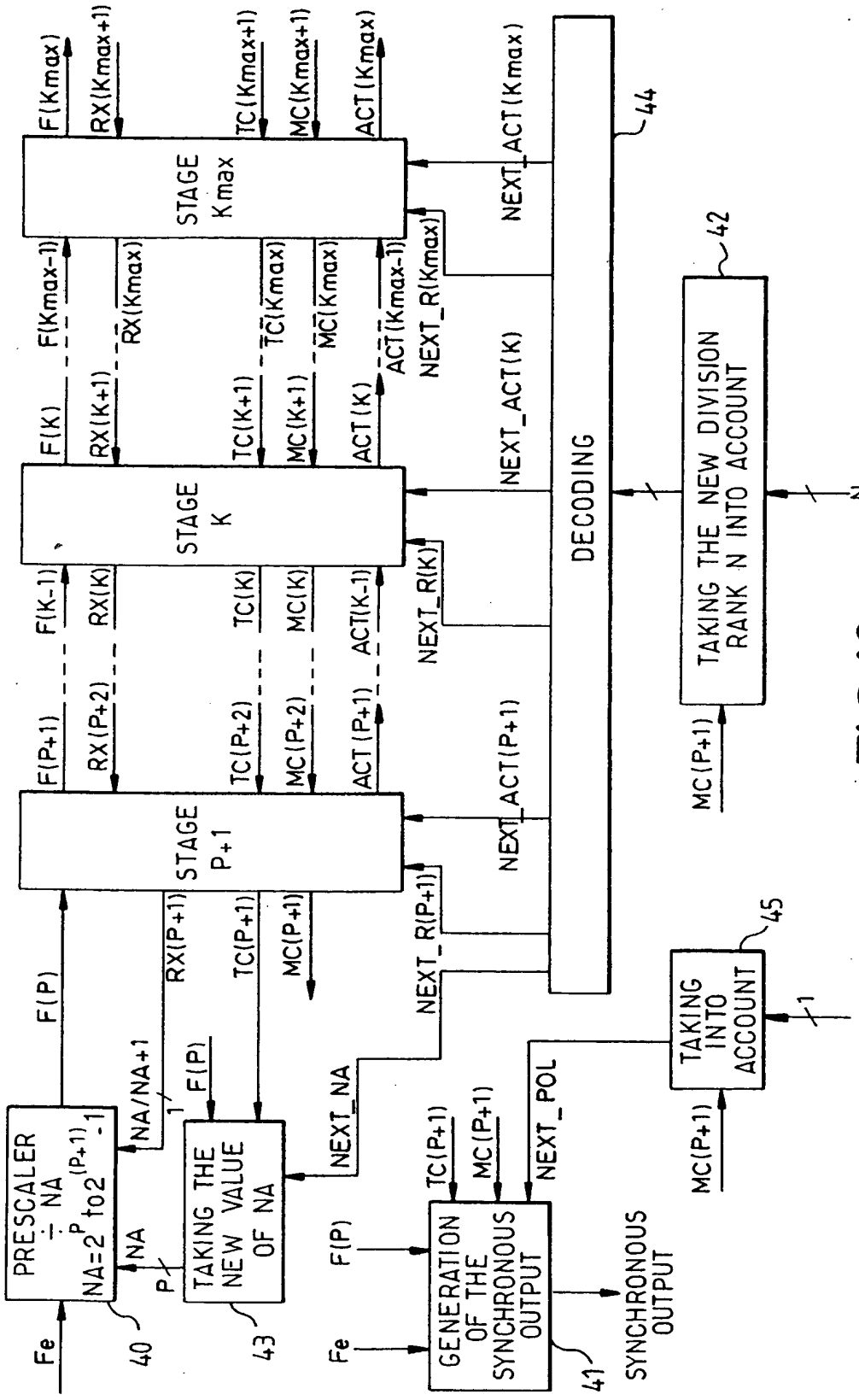
Fe
PRESCALER ÷ NA
NA=2^P to 2^(P+1) -1
NA
NA/NA+1
1
P
40
TAKING THE NEW VALUE OF NA
43
F(P)
NEXT_NA
F(P)
RX(P+1)
TC(P+1)
MC(P+1)
STAGE P+1
F(P+1)
RX(P+2)
TC(P+2)
MC(P+2)
ACT(P+1)
F(K-1)
RX(K)
TC(K)
MC(K)
ACT(K-1)
STAGE K
F(K)
RX(K+1)
TC(K+1)
MC(K+1)
ACT(K)
F(Kmax-1)
RX(Kmax)
TC(Kmax)
MC(Kmax)
ACT(Kmax-1)
STAGE Kmax
F(Kmax)
RX(Kmax+1)
TC(Kmax+1)
MC(Kmax+1)
ACT(Kmax)
NEXT_R(P+1)
NEXT_R(K)
NEXT_R(Kmax)
NEXT_ACT(P+1)
NEXT_ACT(K)
NEXT_ACT(Kmax)
DECODING
44
NEXT_POL
TC(P+1)
MC(P+1)
F(P)
Fe
GENERATION OF THE SYNCHRONOUS OUTPUT
41
SYNCHRONOUS OUTPUT
TAKING INTO ACCOUNT
45
1
MC(P+1)
TAKING THE NEW DIVISION RANK N INTO ACCOUNT
42
N
MC(P+1)

FIG.10

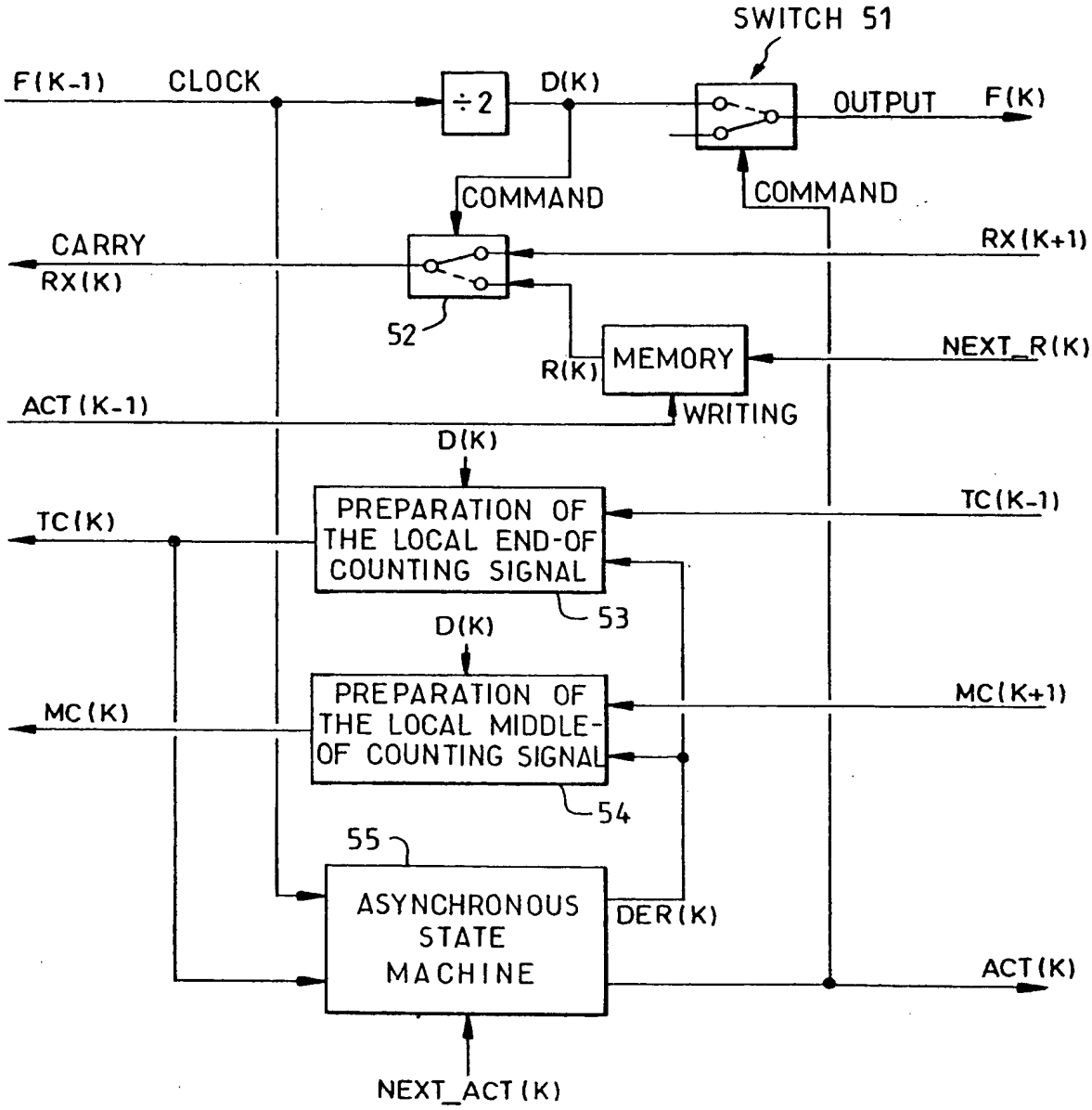
SWITCH 51
F(K-1)
CLOCK
÷2
D(K)
OUTPUT
F(K)
COMMAND
COMMAND
CARRY
RX(K)
RX(K+1)
52
R(K)
MEMORY
NEXT_R(K)
ACT(K-1)
WRITING
D(K)
TC(K)
PREPARATION OF THE LOCAL END-OF COUNTING SIGNAL
TC(K-1)
53
D(K)
MC(K)
PREPARATION OF THE LOCAL MIDDLE-OF COUNTING SIGNAL
MC(K+1)
54
55
ASYNCHRONOUS STATE MACHINE
DER(K)
ACT(K)
NEXT_ACT(K)

FIG. 11

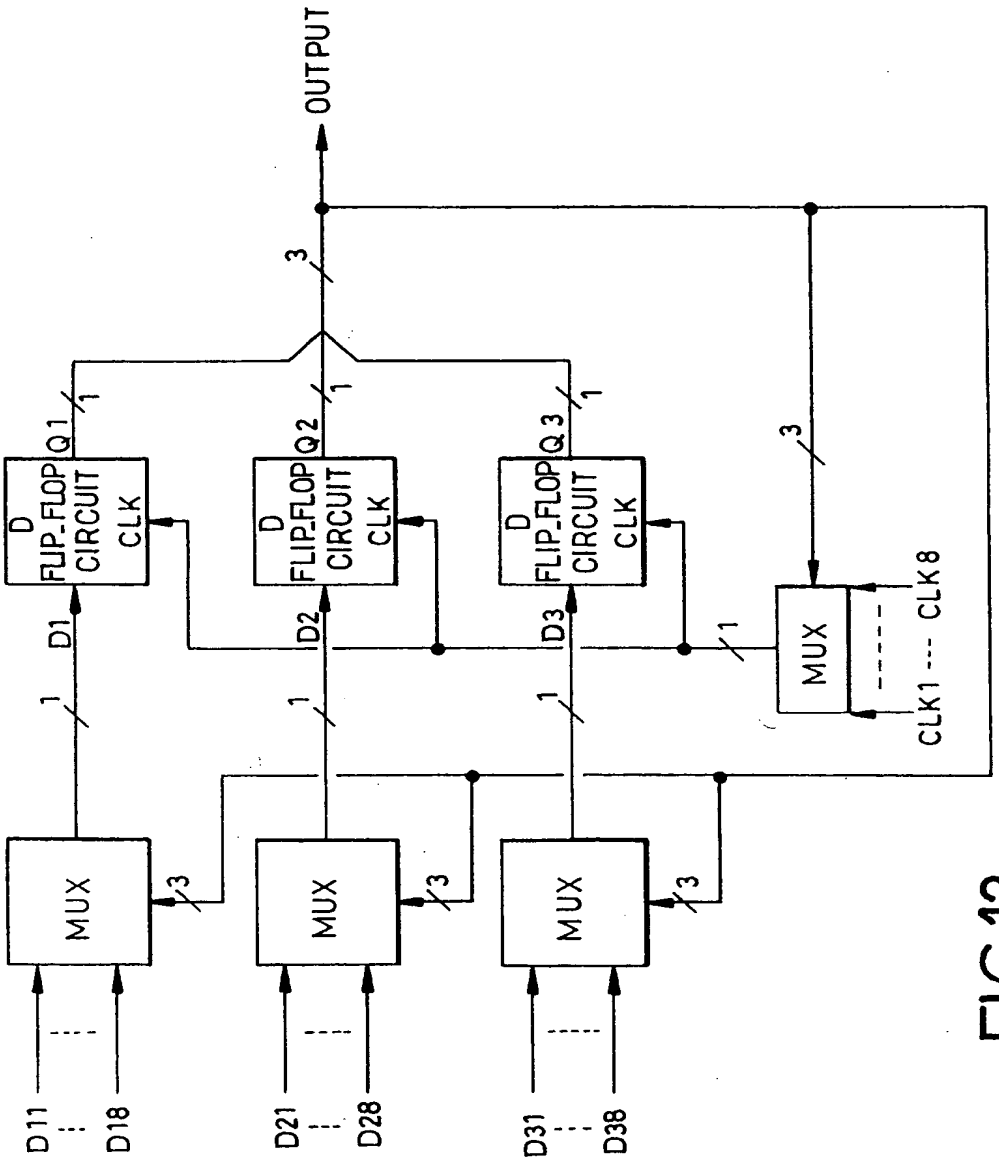
OUTPUT
3
D FLIP_FLOP CIRCUIT CLK
Q1
Q2
Q3
1
3
D1
D2
D3
MUX
CLK1 --- CLK8
D11 --- D18
D21 --- D28
D31 --- D38

FIG.12

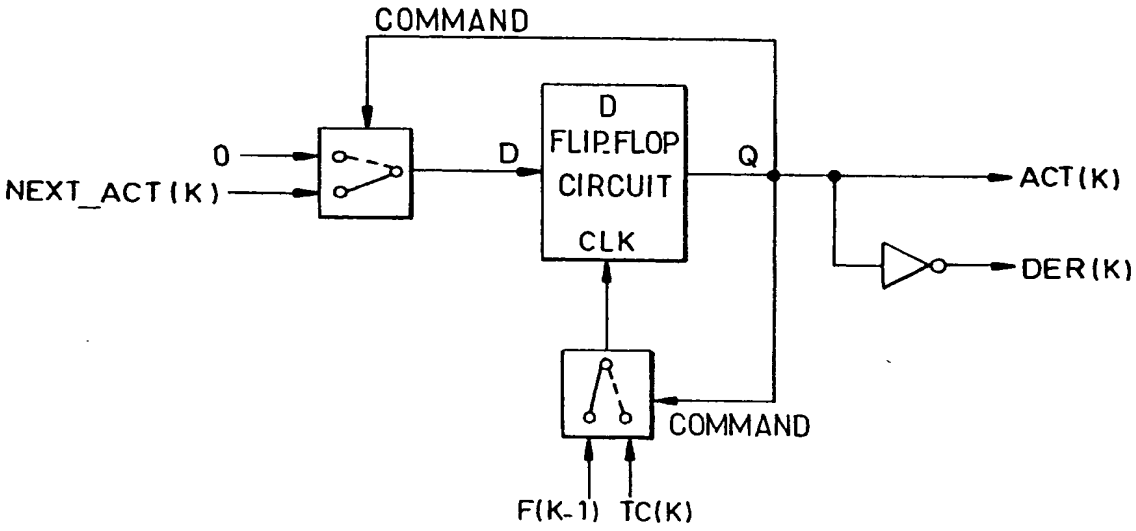
COMMAND
0
NEXT_ACT(K)
D
D
FLIP.FLOP
CIRCUIT
CLK
Q
ACT(K)
DER(K)
COMMAND
F(K-1)
TC(K)

FIG.13